

Creativity and Leadership
in Learning Communities

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The mission of the Center for Ecoliteracy is to foster ecological literacy in K-12 education. Being ecologically literate, or "ecoliterate," means understanding the principles of organization of ecological communities (i.e., ecosystems) and using those principles for creating sustainable human communities. In particular, we believe that the principles of ecology should be the guiding principles for creating sustainable learning communities. In other words, ecoliteracy offers an ecological framework for educational reform.

Ecology, from the Greek *oikos* ("household"), is the study of the relationships that interlink all members of the Earth Household. Ecological thinking, therefore, is thinking in terms of relationships, connectedness, and context. In science, this kind of thinking is known as systems thinking.

I have given several talks here about the principles of ecology and about systems thinking, both here in the library and on faculty retreats. Two of my talks from these retreats are published and available from the Center for Ecoliteracy. One of them, titled "Ecology and Community," deals with the principles of ecology, the other, "From the Parts to the Whole," is about systems thinking.

In my new book, *The Web of Life*, I trace the history of systems thinking through this century and propose a synthesis of several systems theories that were developed during the past twenty-five years, or so. In other words, I present a new conceptual framework for the scientific understanding of life. This new understanding of life has some very interesting implications for the understanding of creativity and leadership, and those are the ideas I'd like to share with you tonight.

Every living system is a network.

LIVING NETWORKS

One of the important early insights of systems thinking was the realization that every living system is a network. This idea appeared first in ecology. From the beginning of ecology, ecological communities

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have been seen as consisting of organisms linked together in network fashion through feeding relations. At first, ecologists formulated the concepts of food chains and food cycles, and these were soon expanded to the contemporary concept of the food web.

The "Web of Life" is, of course, an ancient idea, which has been used by poets, philosophers, and mystics throughout the ages to convey their sense of the interwovenness and interdependence of all phenomena. As the network concept became more and more prominent in ecology, systems thinkers began to use network models at all systems levels, viewing organisms as networks of organs and cells, just as ecosystems are understood as networks of individual organisms. This led to the key insight that the network is a pattern that is common to all life. Wherever we see life, we see networks.

Now, although all living systems are networks, we know, of course, that not all networks are living systems. So what are the characteristics of living networks? One of the most important features of all living networks is that they involve feedback loops. In a living network, there are many cycles and closed loops, and these loops can become feedback loops. A feedback loop is a circular arrangement of causally connected elements, in which an initial cause propagates around the links of the loop, so that each element has an effect on the next, until the last "feeds back" the effect into the first element of the cycle.

In an ecosystem feedback loops tend to bring the system back into balance whenever there is a deviation from the norm, due to changing environmental conditions. For example, if an unusually warm summer results in increased growth of algae in a lake, some species of fish feeding on these algae may flourish and breed more, so that their numbers increase and they begin to deplete the algae. Once their major source of food is reduced, the fish will begin to die out. As the fish population drops, the algae will recover and expand again. In this way, the original disturbance generates a fluctuation around a feedback loop,

which eventually brings the fish/algae system back into balance.

The feedback phenomenon is extremely important for all living systems. Because of feedback, living networks can regulate themselves and can organize themselves. A community, for example, can regulate itself. It can learn from its mistakes, because the mistakes will travel and come back along these feedback loops. So, the community can organize itself and can learn. Because of feedback, a community has its own intelligence, its own learning capacity.

So, networks, feedback, and self-organization are closely linked concepts. We can say that living systems are networks capable of self-organization.

A human community is a network of conversations.

NETWORKS OF CONVERSATIONS

Now we can ask: what is the nature of the links in a living network? The answer will depend on what kind of living system we are talking about. In a cell, the links are chemical processes that interconnect all cell components. In the brain and the nervous system, the links are the anatomical structures of the vast neural network, the billions of axons and dendrites. In an ecosystem, as I mentioned already, the most important links are the feeding relationships; the many ways in which plants, animals, and microorganisms feed on one another.

What are the links in a human community? Well, there has been a lively debate among scientists about how to best describe social networks, and one of the most interesting theories is one by a German sociologist, Niklas Luhmann, who describes a human community as a network of conversations. This network involves multiple feedback loops. The results of conversations give rise to further conversations, which generate self-amplifying loops. Thus an off-hand comment may be picked up and amplified by the network until it has a major consequence. The closure of the network within the boundaries of the community results in a shared system of beliefs, explanations, and

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values—often referred to as the organizational culture—which is continually sustained by further conversations.

So, a living community is a network of conversations with feedback loops, and one of the best ways to nurture the community is to facilitate and sustain conversations. It is interesting that this is now widely discussed in business circles. In a recent article, titled "Conversation as a Core Business Process," Juanita Brown and David Isaacs report that they asked hundreds of executives and employees to describe the quality of conversations that had a powerful impact on them.[1]

They found that the answers they received had a number of common themes. For example:

- There was a sense of mutual respect between us.
- We took the time to really talk and reflect about what we each thought was important.
- We listened to each other, even if there were differences.
- I was accepted and not judged by the others in the conversation.
- We explored questions that mattered.
- We developed a shared meaning that wasn't there when we began;

and so on.

The authors also mention an interesting study by the Institute for Research on Learning in Palo Alto about how learning takes place in an organization. The study concludes: "The most powerful organizational learning and collective knowledge sharing grows through informal relationships and personal networks—via working conversations in communities of practice."

EMERGENCE

Now let me come to another very important property of living systems, which has been identified and explored only very recently.

Every living system occasionally encounters points of instability, at which some of its structures break down and new structures, or new forms of behavior, emerge. The spontaneous emergence of order—of new structures and new forms of behavior—is one of the hallmarks of life. This phenomenon, often simply called "emergence," has been recognized as the basis of development, learning, and evolution. In other words, creativity—the generation of forms that are constantly new—is a key property of all living systems. Life constantly reaches out into novelty.

Detailed studies have shown that the points of instability, at which emergence occurs, are the result of small fluctuations that are amplified by feedback loops. Think again of the off-hand comment in a network of conversations! So, the feedback loops in the network are critical for the system's creativity, and this creativity is manifest in the processes of emergence.

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EMERGENT AND DESIGNED STRUCTURES

During the long history of evolution, all living structures on the planet evolved through emergence in a never-ending display of creativity and adaptation. In other words, all non-human structures on the planet are emergent structures. I said, "all *non-human* structures," because with the evolution of the human species, structures of another type were created. In human evolution, language, abstraction, conceptual thought, and all the other characteristics of human consciousness came into play. This enabled us to form mental images of physical objects, to formulate goals and strategies, and thus to create structures by design.

In human organizations, both types of structures are always present. The designed structures are the organization's formal structures, which are depicted in its official documents and describe the organization's mission, its formal policies, its strategies, and so on.

In addition, there are always emergent structures. These are the

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organization's informal structures—the alliances and friendships, the informal channels of communication (the "grapevine"), the tacit skills and sources of knowledge that are continually evolving. These structures emerge from an informal network of relationships that continually grows, changes, and adapts to new situations.

The two types of structures—designed and emergent structures—are very different, and every organization needs both kinds. Whereas designed structures cannot grow, emergent structures adapt, develop, and evolve. They are expressions of the organization's collective creativity. If we think of the relationship between emergence and design in terms of a continuum, we can say that a system "drifting" too far toward design will become overly rigid, unable to adapt to changing conditions.

On the other hand, if an organization drifts too far toward emergence it will lose the ability to efficiently produce goods or services. The designed structures enable the organization to operate according to certain specifications. They allow the formulation of the rules and regulations that are necessary for the day-to-day management of the organization. So, the challenge for any organization is to find a creative balance between its designed structures and its emergent structures.

LEADERSHIP

It seems that two different kinds of leadership correspond to these two types of structures. The organization's mission is generally the result of a design process. The traditional idea of a leader is that of a person who is able to clearly formulate this mission, to sustain it, and to communicate it well and with charisma.

The other kind of leadership would be the facilitation of emergence. This type of leadership is not limited to a single individual. In self-organizing systems, leadership is distributed, and responsibility becomes a capacity of the whole. Leadership, then, consists in

continually facilitating the emergence of new structures, and to incorporate the best of them into the organization's design. In such an organization, there will be a continual interplay between emergence and design.

How does one facilitate emergence? You will facilitate emergence by creating a learning culture, by encouraging continual questioning and rewarding innovation. In other words, leadership means creating conditions, rather than giving directions.

A culture fostering emergence must include the freedom to make mistakes. In such a culture, experimentation is encouraged, and learning is valued as much as success.

Above all, facilitating emergence means building up and nurturing a network of conversations with feedback loops. The first step toward this goal might be loosening the designed structures and thereby creating more flexibility.

Another important aspect is creating an emotional climate that is conducive to emergence. This means a climate of warmth, mutual support, and trust; but also a climate of passion with plenty of opportunities for celebration.

Finally, we need to realize that not all emergent solutions are viable. Therefore, a culture fostering emergence must include the freedom to make mistakes. In such a culture, experimentation is encouraged, and learning is valued as much as success.

One of the main problems, in business as well as in education, is that organizations are still judged according to their designed structures, not according to their emergent structures. But I would hope that in schools promoting ecoliteracy and systems thinking, there will be more attention to emergent structures and to the leadership that facilitates that emergence.

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[1] Juanita Brown and David Isaacs, "Conversations as a Core Business Process," *The Systems Thinker,* Pegasus Communications, Cambridge, MA, Dec. 1996/Jan. 1997.

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